

METHOD OF MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD FOP FOR AASHTO T 23

Scope

This procedure covers the method for making, initially curing, and transporting concrete test specimens in the field in accordance with AASHTO T 23.

Apparatus

- Concrete cylinder and beam molds conforming to AASHTO M 205
- Tamping rod: 16 mm (5/8 in.) diameter and approximately 600 mm (24 in.) long, having a hemispherical tip for preparing 150 mm (6 in.) x 300 mm (12 in.) cylinders
- Small tamping rod: 10 mm (3/8 in.) diameter and approximately 305 mm (12 in.) long, having a hemispherical tip for preparing 100 mm (4 in.) x 200 mm (8 in.) cylinders
- Vibrator: 7000 vibrations per minute, 19 to 38 mm (3/4 to 1 1/2 in.) in diameter, at least 75 mm (3 in.) longer than the section being vibrated for use with low slump concrete
- Scoop
- Trowel
- Mallet: With a rubber or rawhide head having a mass of 0.57 ± 0.23 kg (1.25 ± 0.5 lb) when using reusable steel molds
- Rigid base plates and cover plates: steel, glass, or plywood
- Sand or earth for initial cylinder protection. As an alternative, coolers or cure boxes providing appropriate insulation may be used. Cure boxes shall have a protective exterior of plywood or other suitable material to prevent damage to the insulation.
- Storage tank (optional) equipped with sufficient heaters to maintain the water at $23 \pm 2^{\circ}\text{C}$ ($73.4 \pm 3^{\circ}\text{F}$) while cylinders are being stored temporarily.

Procedure – Making Cylinders – General

Note 1: There are two methods of consolidating the concrete – rodding and internal vibration. If the slump is greater than 75 mm (3 in.), consolidation is by rodding. When the slump is 25 to 75 mm (1 to 3 in.), internal vibration or rodding can be used to consolidate the sample, but the method used must be that required by the agency in order to obtain consistent, comparable results. For slumps less than 25 mm (1 in.), consolidate the sample by internal vibration. The internal vibration procedure follows this general procedure.

1. Obtain the sample in accordance with the FOP for WAQTC TM 2.

Note 2: Begin making cylinders within 15 minutes of obtaining the sample.

2. Set molds up on the level rigid base in a location relatively free from vibration and close to where they will be stored.

3. Fill each mold approximately 1/3 full with concrete, moving the scoop or trowel around the perimeter of the mold to evenly distribute the concrete.
4. Consolidate the layer with 25 strokes of the tamping rod, using the rounded end. Distribute the strokes evenly over the entire cross section of the concrete. Rod throughout its depth without hitting the bottom too hard.
5. Tap the sides of each mold 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
6. Add the second layer, filling each mold about 2/3 full.
7. Consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the bottom layer.
8. Tap the sides of each mold 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
9. Add the final layer, slightly overfilling each mold.
10. Again consolidate this layer with 25 strokes of the tamping rod, penetrating about 25 mm (1 in.) into the second layer.
11. Tap the sides of each mold 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
12. Strike off the surface of the molds with tamping rod.

Note 3: Floating or troweling is permitted instead of striking off.

Procedure – Initial Curing

For initial curing of cylinders, there are two methods – the use of which depend on the agency. Cylinders must be placed and secured to ensure that the cylinder axis will remain vertical throughout the initial cure period. In both methods, the curing place must be firm, level, and free from vibrations and other disturbances, as it must be for flexural beams as well. Maintain initial cure in a moist environment with a temperature between 16 - 27°C (60 - 80°F). Prevent any loss of moisture.

Method 1 – Initial cure in a chest-type curing box

1. Finish the cylinder using either the tamping rod, float or trowel. Use a sawing motion across the top of the mold. The finished surface shall be flat with no projections or depressions greater than 3 mm (1/8 in.).
2. Place the mold in the curing box. Be careful not to distort the cylinder by squeezing the side of the mold when lifting it (if using a single-use, light-gauge mold). Support the bottom of the mold when moving it to prevent a convex bottom surface (if using a single-use, light-gauge mold).

3. If required by the agency, place a cover plate on top of the cylinder and leave it in place for 24 ± 4 hours.
4. Cap the mold with a plastic lid and tape the lid to the mold.
5. Mark the necessary identification data on the top of the lid.

Method 2 – Initial cure by burying in earth or by using a curing box over the cylinder

1. Move the cylinder with excess concrete to the location where the cylinder will be initially cured.
2. Place the cylinder on level sand or earth, or on a board, and pile sand or earth around the cylinder to within 50 mm (2 in.) of the top.
3. Finish the cylinder using either the tamping rod, float or trowel. Use a sawing motion across the top of the mold. The finished surface shall be flat with no projections or depressions greater than 3 mm (1/8 in.).
4. If required by the agency, place a cover plate on top of the cylinder and leave it in place for 24 ± 4 hours.
5. Cap the mold with a plastic lid and tape the lid to the mold.
6. Mark the necessary identification data on the top of the lid.

Procedure – Making Cylinders – Internal Vibration

1. Perform Steps 1 and 2 in the general procedure.
2. Fill the mold in two approximately equal layers.
3. Insert the vibrator at three different points for each layer. When vibrating the bottom layer, do not let the vibrator touch the bottom or sides of the mold. When vibrating the top layer, the vibrator shall penetrate into the underlying layer approximately 25 mm (1 in.).
4. Remove the vibrator slowly, so that no air pockets are left in the material.

Note 4: Continue vibration only long enough to achieve proper consolidation of the concrete. Over vibration may cause segregation and loss of appreciable quantities of intentionally entrained air.
5. Tap the sides of each mold 10 to 15 times with the mallet (reusable steel molds) or lightly with the open hand (single-use light-gauge molds).
6. Return to Step 12 of the general procedure and continue.

Procedure – Making Flexural Beams – General

1. Obtain the sample in accordance with the FOP for WAQTC TM 2.
2. Set molds up on the level rigid base in a location relatively free from vibration and close to where they will be stored.
Note 5: Begin making beams within 15 minutes of obtaining the sample.
3. Fill the beam mold 1/2 full with concrete.
4. Consolidate the layer with the tamping rod once for each 1200 mm² (2 in.²) of surface area.
5. Tap the sides of the mold 10 to 15 times with the mallet.
6. Spade the concrete along the sides and ends of the mold with the trowel.
7. Add the final layer, slightly overfilling the mold.
8. Consolidate the layer with tamping rod once for each 1200 mm² (2 in.²) of surface area, penetrating about 25 mm (1 in.) into the bottom layer.
9. Tap the sides of the mold 10 to 15 times with the mallet.
10. Spade the concrete along the sides and ends of the mold with the trowel.
11. Strike off the top and finish the surface with the trowel.
12. Cover with moist burlap without allowing the burlap to come in direct contact with the concrete or cover as directed by agency policy.
13. After 24 hours remove from forms and moist cure as per agency policy or specifications.

Procedure – Making Flexural Beams – Internal Vibration

1. Perform Steps 1 and 2 in the flexural beam general procedure.
2. Place the concrete in a single layer.
3. Insert the vibrator at intervals not exceeding 150 mm (6 in.) along the center line of the long dimension of the mold.
4. Allow the vibrator to penetrate the full depth of the specimen, but do not allow it to touch the sides or bottom. Remove the vibrator slowly, so that no air pockets are left in the material.

Note 6: Sufficient vibration has been applied as soon as the concrete surface has become smooth. Over-vibration may cause segregation and loss of appreciable quantities of intentionally entrained air.

5. Return to Step 9 of the flexural beam general procedure and continue.

Procedure – Transporting Specimens

After the 24 to 48 hours of initial cure, the specimens will be transported to the laboratory for storing under standard conditions. Specimen identity will be noted along with the date and time the specimen was made.

While in transport, specimens shall be:

- Protected from jarring, freezing or moisture loss.
- Cylinders shall be secured so that the axis is vertical (held straight, up and down).

